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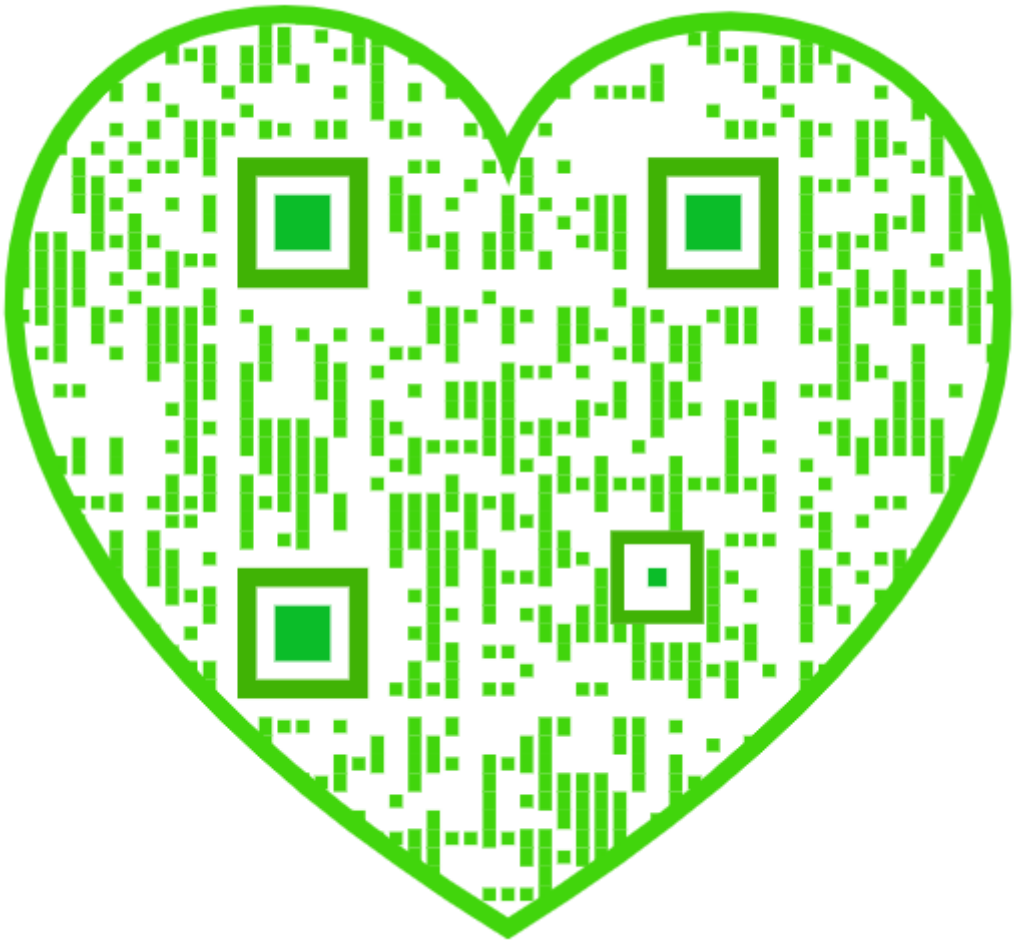
THE SANITATION OF A COUNTRY HOUSE

BY HARVEY B. BASHORE



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THE SUMMER CAMP. (See page 84)
Frontispiece.

The Sanitation of a Country House

BY

DR. HARVEY B. BASHORE

Inspector for State Board of Health of Pennsylvania
Author of "Outlines of Rural Hygiene"

"Eldest-born of powers divine,
Blessed Hygeia, be it mine
To enjoy what thou canst give,
And henceforth with thee to live!"
—COWPER

With Sixteen Illustrations

FIRST EDITION
FIRST THOUSAND

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1905

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BY
HARVEY B. BASHORE

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To

My Parents,

who have done so much for me,
this little volume
is most affectionately
dedicated.

PREFACE.

WHILE municipal hygiene has made much progress during the last hundred years, the rural districts still cling to their old-fashioned ways, still trust in Providence and the "old oaken bucket."

When we find that our summer resorts on seashore and mountain sometimes bring sickness instead of health, that our springs and our brooks may bear the germs of disease; when we find that there are rural localities which have more typhoid fever per popula-

tion than our great cities, that there is actually less danger of getting typhoid fever in New York City than in a good many country places; when we find that cities are spending millions for filter plants and yet receive twenty-five per cent of their typhoid from the country; when we find all this and more, too, to be actual facts, is it not worth while to think about sanitary reform?

To make the country as healthy as the city—contradictory as it may seem—is the aim of this work.

West Fairview, May 1, 1905.

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Sanitation of a Country House.

CHAPTER I.

THE LOCATION.

When one comes to build a house in the city he is more or less restricted by the requirements of the city; and the kind of neighborhood, business and social advantages are weighty points. The sanitary conditions surrounding his house are little under his own hand; the city authorities look after such things with the paternal care of patriarchal times. He buys a lot in the locality selected and builds thereon his

house, facing the street of course, whether it is east or west, north or south. Over the adjoining buildings he has no control—they may overtop his own and keep out the sun, they may prevent him from having a fine view across a neighboring river, but for this there is no remedy; he must confine himself to his own narrow lot. He has, however, the consolation that there are some compensations to be derived from this state of affairs; for example, the network of sewers, and trenches of various kinds, keep soil drainage good, and save him the troubles that might arise from an otherwise damp soil. The city also sees to it that he has good (?) water and that his household wastes are quickly disposed—got out of sight at least.

When it comes to a country house the

whole thing is changed: the owner alone is responsible for every condition in and around his premises, and can select at the beginning a location favored by proper sanitary conditions. But in order to be able to do this one must have some knowledge of the sanitary methods of house-building.

In the first place, the general topographical features of the proposed site must be taken into consideration, and individual taste counts for much in such a case. There are certain points which should be held in mind; for instance, one would hardly select a narrow valley, a low meadow, or the north side of a high hill for a dwelling-place. Common sense has taught us that a slight elevation, having proper surface drainage, with protecting hills or woods on the north, is far more pref-

erable; and then if we add a stretch of water—lake, river, bay, or ocean—to the foreground of the east or south, we would have a pretty fair location as far as the surface is concerned.

Whatever the location, it is well, very well indeed, to pay considerable attention to the outlook from the proposed site, for fine scenery is not to be despised as a sanitary measure. A fine view from one's dining-room window certainly acts as an aid to digestion, if it does nothing more.

If there is no natural barrier on the north, this deficiency may be made up by planting a grove of evergreens, spruce or pine or fir, which will keep off the cold winds better than anything else; then a grove of trees makes a fine recreation-ground, which furnishes wholesome pleasure to man, woman, or child.

The preferred direction which a house should face, as I have indicated, is more or less southerly in the country east of the Mississippi, on account of the prevailing westerly winds of this region, and the necessity for getting as much sunlight as possible in the greatest number of rooms.

After one has a good idea of the surface conditions of the projected site, some study should be expended on the character of the subsoil and rock of the place; the principal sanitary factors in this connection being the water and air in the soil, their relations to each other and to the surface. The water in the soil is divided for sanitary study into the ground-water and the ground-moisture.

The ground-water—the first worth considering—is that underground sheet

of water which completely fills all the interstices of the soil; its height is readily told by the height of water in neighboring wells. This water is in constant motion to the nearest water-courses, and also rises and falls with the changing seaons. The ground-water, unless very near the surface, has not much effect on a building site except when it comes to procuring drinking-water from wells; then it becomes of cardinal importance and is treated in this relation in a future chapter.

The other item, ground-moisture, is that moisture which is in the upper layers of the soil—above the ground-water level—due to the interstices containing both air and water; and it is this which causes damp and unhealthy foundations. This dampness of the soil

is derived mostly from surface-waters percolating from above, and tends to rise by capillary action and hydrostatic pressure. Ground-moisture is directly proportional to the absorptive power of the soil and inversly as its permeability; consequently it is evident that by increasing this permeability we can diminish the dampness: and this is what we do by trenching and tiling. This undue dampness is, as has been mentioned before, supposed to be a potent factor in the causation of rheumatism, and it has also been claimed that there is a relationship between soil-dampness and phthisis. Although we know that this disease is due to a specific germ, it is quite likely that damp dwellings may so prepare the individual as to less easily withstand the inroads of the germs.

The ground-air is interesting to the sanitary house-builder in two phases, namely, its composition and movement. It is made up partly of gases arising from decomposition and putrefaction processes which are continually going on in the soil, especially in that which is contaminated with organic waste; and the resultant gases diffuse rapidly through the surrounding locality. Carbon dioxide, which is one of the gases formed, is always greater in ground-air than in the atmosphere, while oxygen, on the other hand, is decreased and nitrogen remains about the same. In addition to the gases there are certain amounts of ammonia, hydrogen, ammonium sulphide, and marsh-gas which go to make up ground-air; and thus differing greatly in composition from the atmosphere, it is surely

not suitable for breathing purposes. In addition, too, we are not certain that it does not, at times, contain disease-germs.

The second disturbing factor of the ground-air—its movement—is of considerable importance. It has been found that the wind blowing against the surface soil sets this underground air in motion; likewise, too, any change in the ground-water level will occasion fluctuations in the air above. During a heavy rain, for example, the surface-waters flowing downward press upon the ground-air and compress it. Underneath a dwelling, if the cellar is not properly protected, there is an area of diminished pressure, and consequently the ground-air pours into the cellar and thence into the house above. In winter, during heavy frost, similar con-

ditions exist, when the frozen ground is more or less impervious; and then the warm, unfrozen, and porous part underneath the house readily facilitates the ascent of the air below.

With this knowledge of the ground air and water it becomes evident that there is a great difference in the various soils when it comes to building a house. A clay soil, such as is found in the alluvial deposit of our river valleys and seacoast, and that resulting from the decomposition of limestone and certain other rock, is almost impermeable, and having considerable absorptive power and being capable of holding much moisture, it is consequently damp; it is also cold on account of its low specific heat and constant evaporation. For these reasons there is a great tendency to rheumatic complaints in people

living on such a soil. It has been found, however, that much of this soil danger may be reduced by efficient subsoil drainage, for as the water is withdrawn from the soil more air is admitted and greater dryness follows.

When we come to the various beds of sandstone, gravel, and shale just the opposite condition exists, namely, a warm, dry, and porous soil. Natural drainage is so good and the ground-water so low that scarcely any preparation is necessary in order to get a dry foundation. On the other hand, such soils, being so very porous, are liable to contamination by water and air from neighboring cesspools and privies, and consequently the usual care is needed in this respect, especially if polluted soil exists anywhere near the place. Other soils may need other

lines of investigation, but the foregoing illustrate the method of procedure. Suffice it to say that each and every location should receive individual study with reference to its own peculiarities and possibilities.

CHAPTER II.

THE HOUSE.

After the site for a dwelling has been selected, the first thing is its preparation, which consists in taking measures to reduce to a minimum the deleterious influences of the ground-moisture and ground-air mentioned in Chapter I. In the beginning, then, in order to prepare a place for building it is necessary to drain thoroughly the subsoil about the foundation. This is readily done by digging trenches surrounding the proposed foundation of such a depth as to reach a foot or two below the bottom of the wall and hav-

ing an outlet in some lower level or stream. The trenches should be filled for a foot or so with broken stone, or a course of drain-tiles may be laid at the bottom. Probably filling with broken stone for half the depth and then covering with a layer of ashes is the most effective method. It has the advantage of being very cheap, for stones and ashes can be got almost anywhere in the East, at least, for the asking. The surface drainage, too, must receive considerable attention; sufficient grading being done so as to remove all water as rapidly as possible.

After this work follows the foundation proper. The common way of making this is simply to dig the cellar the required size and depth and build the wall around this excavation, and in

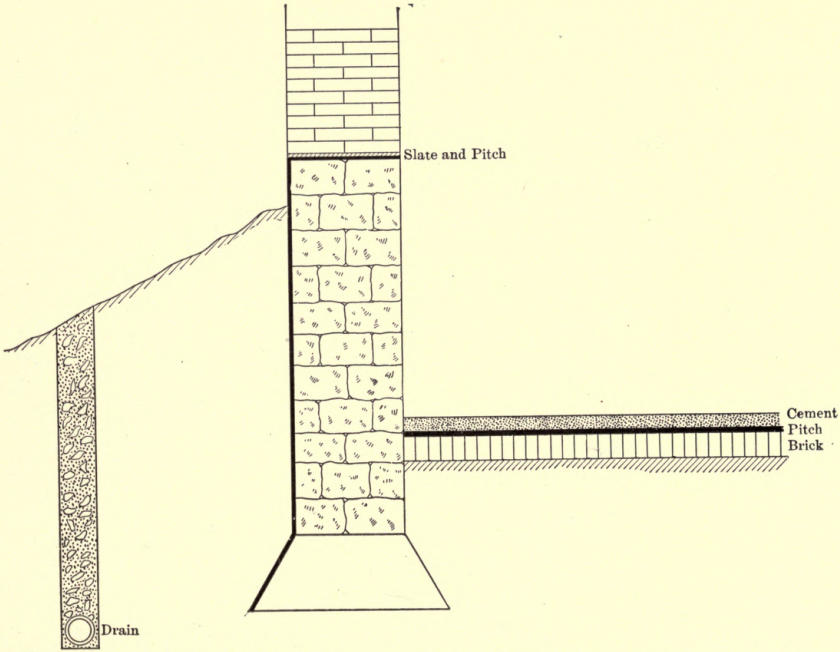

FIG. 1.—PROPER METHOD OF CONSTRUCTING FOUNDATION. (AFTER WARING.)

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some very dry, porous soils such a crude method seems to give a fair foundation; but in most soils and in most places other preparation is needed. It is better to have a free space between the outside of the wall and the surrounding earth, and this space should be packed with well-beaten clay, as recommended by the late Col. Waring. Better, or rather in addition, the outside of the wall should be coated with pitch and a damp-proof course, consisting of a layer of pitch and slate, should be laid in the wall above the ground-line. (Fig. 1.)

In the next place, the cellar floor should receive our attention. This may be made with a layer of well-beaten clay, which is almost impervious to air and water, or a layer of bricks covered with melted pitch and then cemented

or covered with concrete. A foundation with its cellar and the area about it prepared in this way insures the occupants of the house against any trouble from the soil, and is well worth the extra trouble and expense incurred.

Such is the method for constructing the new foundation, but a good many houses have not been built in this manner, and are sadly defective with their wet and mouldy cellars. Yet much can be done that will improve such a building and make it more habitable. In the first place, the surrounding drainage should be improved by means of the trench described above, and this alone will generally give great relief. An additional security is gained by digging away the earth for several feet from the outside of the wall, and then leaving this open

for an air-space, or, better, coating the wall with pitch and filling in next to the wall with puddled clay. The cellar floor should be treated, just as in a new building, to a layer of bricks, pitch, and concrete.

In the construction of the house it is desirable, from a sanitary point of view, to have it so arranged that the greatest number or all of the rooms receive sunlight part of the day, as there is no disinfectant nor deodorant equal to sunlight, none so cheap and none to make up its absence. This arrangement can, of course, only be readily made when one has plenty of room, but there are a good many houses —country houses in a sanitary sense —which are built on suburban lots, and consequently the owner cannot have the same choice of position; yet

by proper planning even the suburban lot can be made to yield very good results to the prospective builder. Take as an example the case of a lot facing the street or road on the north. The usual way to build on such a lot is, and always has been, to have the front of the house face the road (Fig. 2*a*). This, however, gives the least possible amount of sunshine and light to the principal rooms in the house, while the kitchen and back rooms get the most of it. As it is impossible to turn the lot around and have it face the right direction, we must do the next best thing and turn the house around, as shown in the second part of the plan (Fig. 2*b*). The occupants of a house built after this method cannot see the dusty road so easily, but it is a good deal better

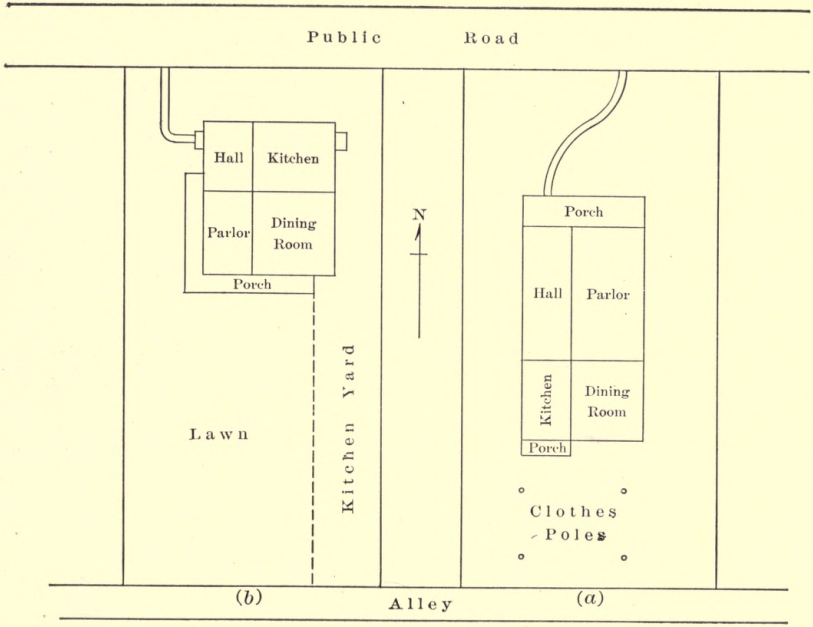

FIG. 2.—THE HOUSE ON A SUBURBAN LOT.
(*a*) Old Method. (*b*) New Method.

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and healthier to face a beautiful back yard than any road or street.

The material of which a house is built depends generally on economic conditions. Brick and stone are more desirable, of course, than wood, less exposed to currents of air and changes of temperature, and in some localities do not cost much more. Just at present, in most of the Eastern cities, brick is as cheap as, if not cheaper than, wood, and in the future the increasing scarcity of wood will necessitate the use of these other materials or perhaps the use of concrete, which is gaining much favor as a building material. Brick and stone houses, on the other hand, are likely to become damp, unless the walls are double; that is, the plaster must never be put directly on the wall, but an air-space must

be left by "furring" (as the builders say) the lath away from the wall by strips of wood which leave a small interval between the lath and wall.

The heating of a country house differs in no wise from that of a city house; hot air, hot water, and steam being the three principal methods. In addition to the furnace, it is desirable to have open fireplaces, not only for heating during spring and fall, when the days are damp and chilly and the furnace is not in operation, but for the cheerfulness it adds to a room and, in addition, for its value as a ventilator; for nothing save a rotary fan is comparable to an open fire for getting the foul air out of a house, and a room which contains one never gets the peculiar

FIG. 3.—THE OLD FRANKLIN.

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odor so characteristic of deficient ventilation.

In some places where wood is becoming almost too scarce and too expensive to use in an ordinary fireplace, the old-fashioned Franklin stove, or "Pennsylvania fireplace" as Franklin himself called it, is a worthy substitute, on account of the great saving of fuel. The designer says: "The use of these fireplaces in very many houses, both of this and the neighboring colonies, has been and is a great saving of wood to the inhabitant. Some say it saves five-sixths, some say three-fourths, and others much less. I suppose two-thirds or one-half is saved. My room is twice as warm with one-fourth the wood as formerly used." If it was necessary in Franklin's day to economize fuel, it is a hundred times more

necessary now, and I predict as the years go by that the "old Franklins" will have a place with those who love a wood fire.

CHAPTER III.

WATER-SUPPLY.

THE water-supply of a country house is probably its most important point from a sanitary view, for it is by this means that typhoid fever is generally transmitted, even in the milk-supply from the farm. While the city dweller is almost absolutely dependent on municipal management for the water which he uses, in the country, on the other hand, the whole subject rests on the care or carelessness of the individual householder. On this individual care, consequently, rests very often the responsibility as to the presence or

absence of typhoid fever in a certain place, and the undue prevalence of this one disease in the rural districts may well excite caution and forethought in the prospective rural dweller.

The common sources of water-supply for country houses are the neighboring springs, streams, lakes, and wells, all of which may be very good or very bad, depending on local conditions. A spring, like many other things in this world, is just as good as its surroundings. If it happens to be situated on an uninhabited and uncultivated upland it will likely yield a pure water, and if near enough and constant enough may furnish the most available supply, especially if it is at such an elevation that it can be used by a gravity system.

Since springs are only overflows of

the ground-water, their condition is dependent on the geological character of the strata through which the water passes. In a region in which the strata have been upturned and broken there may be a seepage of pollution from places little suspected, unless one is thoroughly conversant with the place. Out of a series of fifty-two wayside springs examined several years ago, only sixteen yielded absolutely unpolluted water. While most of the remaining thirty-six yielded a water which was not really dangerously polluted, it illustrates especially how great is the necessity for using care.

In a limestone region, on account of the many underground seams and tunnels which transmit water with great facility, without the filtering properties of the soil, pollution and

infection may travel for miles. In such a region there are always many beautiful springs, but they need watchful care and study before one can be sure of the purity of the water.

Lakes, rivers, and small streams are other available sources of water, but local conditions must be thoroughly studied before resorting to these for a supply. Other things being equal, the larger the body of water the more likely it is to be safe, on account of the great dilution of any possible contamination. A case of typhoid fever on the banks of the Susquehanna or the Delaware does not amount to very much as a source of danger, but the same case on some small rivulet may become a focus for spreading disease.

The "babbling brook" is not always the thing of purity it seems to be, for

FIG. 4.—THE UPLAND BROOK—"PURE AND UNDEFILED."

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it has been the means of starting many an epidemic. It is only when such a brook comes from an uninhabited upland that it is pure and safe, and even then the consumers of the water should control its gathering-grounds if they expect to keep the water pure. It is well to remember that the price of pure water, wherever you go, is everlasting and unremitting vigilance. In Fig. 4 is shown a photograph of one of these upland brooks, as it flows through a wild ravine of ancient pines and hemlocks; babbling and gurgling over falls, forming cascades and pools, sparkling in the sunlight, it seems like the elixir of life to the thirsty wayfarer.

The headwaters of this same brook show quite a different picture, for it meanders through tilled fields and over

filthy highways. On its drainage area there are, too, five dwellings, and in three of them typhoid fever has been a real and recent scourge.

Unfortunately this is the tale of many an upland stream, and the only safe way, before one gives much thought to a stream as an available source of water-supply, is to see the other end to its "uttermost parts."

Another source of water for the rural dweller is the well, and with this, too, special care is necessary. The danger of the ordinary shallow well is known to every one, but there seems to be an idea that a deep well always yields good water. Still, while a deep well is more likely to yield good water than a shallow one, the fact that a well is deep is no proof of its purity.

I would like to add an additional

word of caution about the ordinary shallow well, for of late the abandoned farm with its ancient well has begun to figure as a place for country homes. The country people love these "old wells." If you question, the answer is: "Why, of course, nobody ever got sick from our well." I once came across just such a well. Three generations back this old well had furnished water for the same family, and no one, in truth, ever became sick from it. At last the old folks died, and the second generation started on their way with a large family of sons and daughters; still no one became sick. The third generation became men and women, and still resided at the old homestead. Then at last, after so many years, the old well began its deadly work. One after another of the family was

stricken with typhoid fever until four were ill at one time, and that home will never be the same it once was, for there are two vacant places; and this old well, which before had "never made any one sick," proved, on examination, to be grossly polluted. Examination of these farm-wells has been progressing in most parts of the country, and the unfitness of this source of supply is a striking feature, whether we take it in Canada or in Florida, in Pennsylvania or in California.

In considering wells one should remember that the geological character of the strata has much to do with the purity of the water, and right here it is necessary to recognize the fact that every deep well is not an Artesian well. Artesian wells are those which

pierce geological basins, but geological basins do not exist everywhere, and while a well might be a thousand feet deep in the upturned and contorted strata of the Apalachian plateau, it would really not be an Artesian well. Such deep wells as do pierce these regions of upturned strata are especially prone to pollution, on account of the great facility with which drainage follows lines of rock cleavage. In a region like this a well might be easily infected from some distant source, and increasing the depth of the well, which is frequently done, may possibly increase the danger by opening up new channels from the increased area of drainage. Only a careful study of a place will give positive results as to the reliability of a well-water. Better it is to study the locality at first than to

sink several hundred dollars and then find the water polluted.

The purification of a water-supply is not of much interest to the dweller of a country house, for he is nearly always able to obtain a supply already pure. There is one item of this subject worth some attention, however, and that is the growth of algæ, which is likely to occur in the purest water. This green scum, while probably not detrimental to health, gives the water a peculiar, fishy flavor which makes it very unpleasant for drinking. Fortunately we have a cheap and efficient remedy for the treatment of this condition, which consists in making a dilute solution of copper sulphate in the water affected. The usual method of doing this is to immerse in a spring, pond, or reservoir a coarse sack con-

taining an amount of copper sulphate sufficient to make a strength of about 1/4,000,000—something like one grain to sixty gallons. I know of a man who had piped water to his place from a mountain spring, and shortly afterwards found that algæ were growing plentifully in the water and stopping up the pipe. He treated the spring with copper as above described, and obtained relief in twenty-four hours.

So much for the question of pure water—a question needing no consideration, were it not for the almost universal defilement of the soil about our springs and watercourses, brought about solely by human carelessness and neglect. That such is the case is very lamentable, and that such could be easily remedied is apparent to every one. John Ruskin has so well depicted

this state of affairs in England—a condition the like of which we ourselves are fast approaching—that it seems worth while to quote him without reserve. "Twenty years ago," says the distinguished author, "there was no lovelier piece of lowland scenery in South England, nor any more pathetic in the world, by its expression of sweet human character and life, than that immediately bordering on the sources of the Wandel, and including the low moors of Addington and the villages of Beddington and Carshalton, with all their pools and streams. No clearer or diviner waters ever sang with constant lips of the hand which 'giveth rain from heaven'; no pastures ever lightened in springtime with more passionate blossoming; no sweeter home ever hallowed the heart of the

passer-by with their pride of peaceful gladness, fairhidden, yet full-confessed. The place remains nearly unchanged in its larger features; but with deliberate mind I say, that I have never seen anything so ghastly in its inner tragic meaning as the slow stealing of aspects, of reckless, indolent, animal neglect, over the delicate sweetness of that English scene; nor is any blasphemy or impiety, any frantic saying or godless thought, more appalling to me, using the best power of judgment I have to discern its sense and scope, than the insolent defiling of those springs by the human herds that drink of them. Just where the welling of stainless water, trembling and pure, like a body of light, enters the pool of Carshalton, cutting itself a radiant channel down to the gravel, through

warp of feathery weeds, all waving, which it traverses with its deep threads of clearness, like the chalcedony in moss-agate, starred here and there with white grenouillette; just in the very rush and murmur of the first spreading currents, the human wretches of the place cast their street and house foulness; heaps of dust and slime, and broken shreds of old metal, and rags of putrid clothes; which, having neither energy to cart away nor decency enough to dig into the ground, they thus shed into the stream, to diffuse what venom of it will float and melt, far away, in all places where God meant those waters to bring joy and health. And, in a little pool, behind some houses farther in the village, where another spring rises, the shattered stones of the well, and of the little fretted channel which

was long ago built and traced for it by gentler hands, lie scattered, each from each, under a ragged bank of mortar, and scoria, and bricklayer's refuse, on one side, which the clean water nevertheless chastises to purity; but it cannot conquer the dead earth beyond; and there, circled and coiled under festering scum, the stagnant edge of the pool effaces itself into a slope of black slime, the accumulation of indolent years. Half a dozen men, with one day's work, could cleanse those pools and trim the flowers about their banks, and make every breath of summer air above them rich with cool balm, and every glittering wave medicinal, as if it ran, troubled only of angels, from the porch of Bethesda. But that day's work is never given, nor, I suppose, will be; nor will any

joy be possible to heart of man, forevermore, about those wells of English waters."

How truthfully this description, with a slight change of names, would suit our own springs and pools!

CHAPTER IV.

WASTE DISPOSAL.

In taking up the study of waste disposal it is necessary to remember that "out of sight, out of mind," is not hygiene. The use of his senses long ago impelled man to put away his waste products, and this was the first step in the evolution of waste disposal. The use of reason—the second step—born by the labor of countless centuries of costly mistakes has taught us that these wastes must, in addition to being put away, be turned into harmless compounds before we can call the work complete. Though this seems

very simple in theory, in practice, on account of the complicated conditions of modern civilization, we often fall far short of the ideal.

In most country houses water under pressure is available, and when this is so water-carriage of excreta is certainly desirable, necessitating thereby the use of water-closets and plumbing, just as in the city. Then there follows, of course, the use of the sewer and the great question of sewage disposal. If one is situated near the sea or on a tidal river, the easiest method is to run the sewage directly into this. It is not admissible, however, to run raw sewage into a fresh-water stream or lake. This is, nevertheless, frequently done, and it has a bad moral effect on the rural citizen, who is by no means overburdened with sanitary

devices. Of course, some of our great fresh-water streams seem to have been given over to sewage by the cities along their banks, and the country resident living on such a stream could hardly be blamed for using it for his own sewage disposal.

When it comes to the smaller streams and lakes such a plan is wholly inadvisable, and some form of disposal plant becomes necessary.* Intermittent sand filtration is a method which disposes of sewage satisfactorily and gives an effluent which can be turned safely into any stream however small. A plant of this sort, though used extensively in various small towns, is only advisable for certain houses where

* I have purposely omitted mention of the ordinary cesspool—a relic of medieval shiftlessness and carelessness for which no excuse can be offered.

the character of the soil or the topography makes it difficult to use one or the other method of irrigation—surface or subsoil—either of which is an ideal plan of disposal for nearly all isolated houses.

In surface irrigation the sewage is simply distributed over cultivated land, where it is rapidly absorbed and the filth disposed of by the numerous bacteria of the soil. By this method (Fig. 5) the sewage from the house is first sent to a settling-tank, or rather an intercepting-chamber, where the solid material is decomposed and macerated into very small particles; from this the liquid passes into a flush-tank, from which it is discharged by an automatic siphon into surface gutters, and from these allowed to spread over the ground or run into furrows between

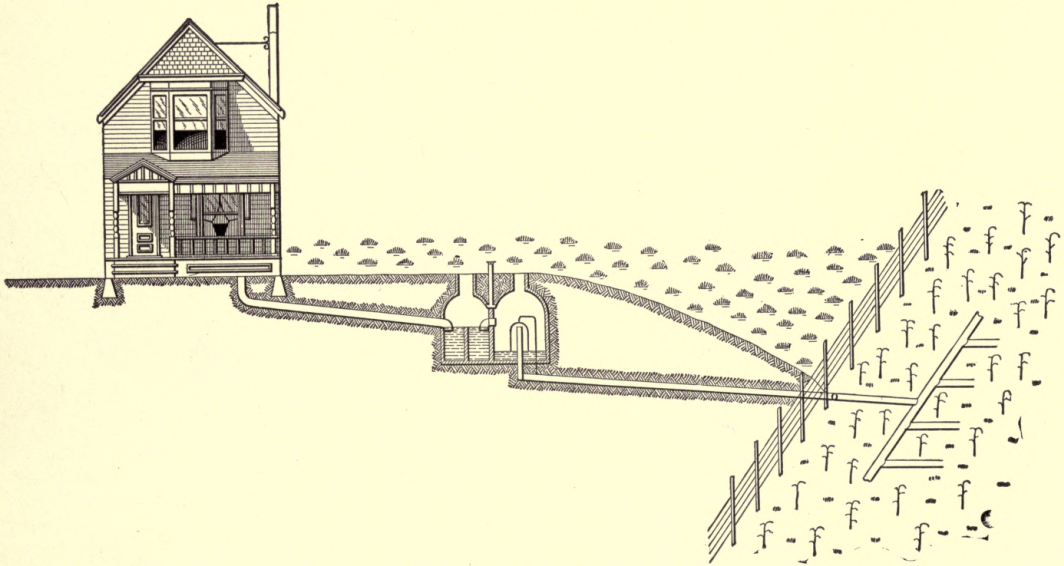

FIG. 5.—A METHOD OF SEWAGE DISPOSAL FOR AN ISOLATED HOUSE.

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growing vegetables or grain. The intermittent flow of sewage, which is brought about by the use of the siphon, is a desirable feature for the efficient working of this plan, especially in winter.

Surface disposal of sewage in this manner is perfectly satisfactory and creates no nuisance. In some instances, however, due to lack of suitable location, subsurface irrigation might be more desirable. The house arrangements in this case are the same as for a surface plant except that the foul liquid, after leaving the flush-tank, flows into open-jointed drain-tiles laid under the ground near the surface—within eight or ten inches at least. This last is important, for the reason that the filth-destroying bacteria are vastly more numerous near the surface. In putting up a

plant like this the flush-tank should have a capacity of something like fifty (50) gallons for each person, and in good absorptive soil about one hundred (100) feet of two-inch tile for each fifty (50) gallons capacity of tank.

There is yet another method simpler and less costly than those described, provided land is abundant and the house at a considerable distance from other dwellings. In this method the settling- and flush-tanks are eliminated and the sewage is turned directly from the house to the land, flowing from the sewer into shallow trenches, between which corn, vegetables, or trees may be planted. In order not to overtask the land at any one place the trenches should permit of being blocked at various points so as to divert the sewage into different trenches

COMBUSTIBLE. NON-COMBUSTIBLE. PUTRESCIBLE.

FIG. 6.—RECEPTACLES FOR SORTING AND COLLECTING WASTE.

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A wintry climate does not interfere with the working of these various sewage farms, for the sewage, more or less warm, readily cuts its way through snow and ice and gradually filters through the soil beneath.

With the sewage disposed of, there yet remain certain other waste products to be gotten rid of—garbage from the kitchen, rubbish of various kinds, and ashes. The disposal of these products becomes easy if the various kinds are collected and kept separate. A good way is to have a series of receptacles for the different materials, as I have shown in the photograph (Fig. 6), and a certain place for each one. The paper, rags, rubbish, etc., for which flour-sacks, supported by iron racks, are used, might be still further subdivided, according to circumstances.

Another, perhaps better way of collecting, is to have the receptacles arranged in one place, instead of being scattered here and there about the premises; for example, in a large box placed at the back of the house near the kitchen door, so as to be readily accessible. Such a box is shown in Fig. 7; and while this one was only made for four separate compartments, it can be easily constructed with as many as may be desired.

Now as to the ultimate disposal of household waste. The garbage is best got rid of by earth burial — simply put into a shallow furrow in a field and covered with a little earth. If the vegetable-bed is near the kitchen, a good way is to have a hole in the bed and practice daily disposal of the garbage. Every evening the garbage

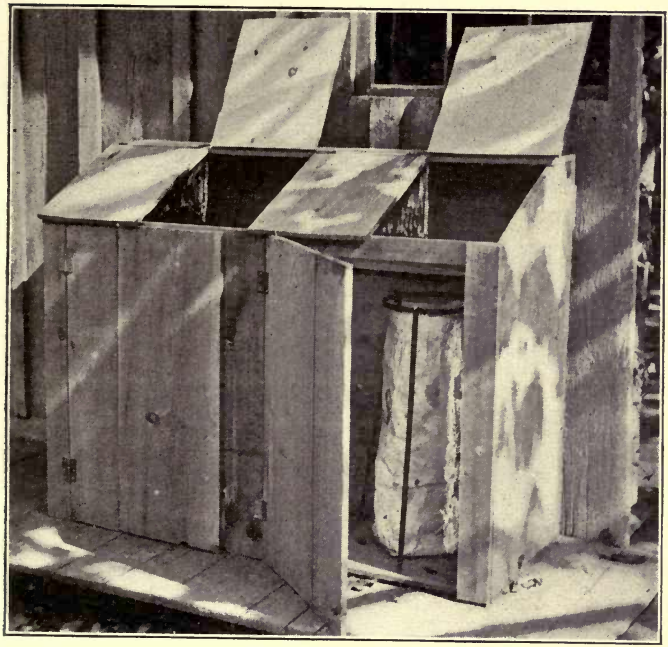

FIG. 7.—BOX FOR WASTE-RECEPTACLES.

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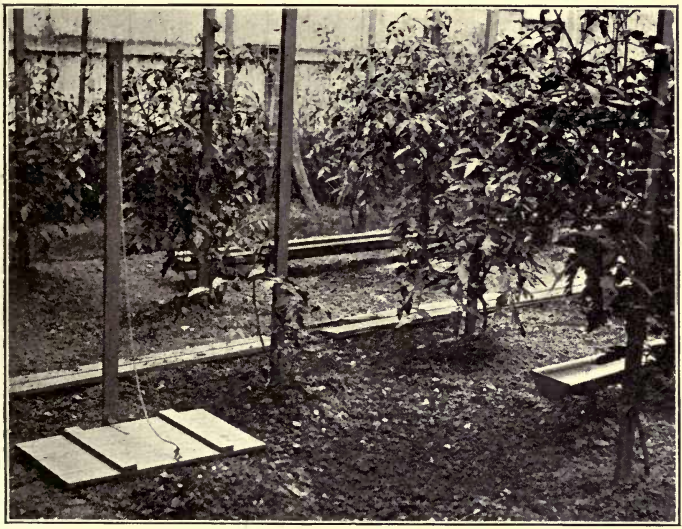

FIG. 8.—GARDEN-BED SHOWING COVER FOR GARBAGE-HOLE, DRAINS, ETC.

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should be covered with earth; and, in addition, a tight board lid should cover the hole during the summer months (Fig. 8), else the place may become a breeding-place for flies and degenerate into a nuisance. Screening the hole, which I have tried, will not be sufficient, for the little fruit-flies, which are very likely to choose such a breeding-place, will creep through a screen of the smallest mesh.

The non-combustible part of the rubbish, such as bottles, tin cans, scraps of metal, etc., can usually be sold to the junk-dealer; and the combustible part, if not salable, should, of course, be destroyed by fire. Ashes can be used in almost any place for filling, making paths, or for a foundation under pavements, than which there is nothing better, the engineers say.

We have now to consider that class of country houses—generally of the smaller kind—where a sewerage system is not available, and for such we have to adopt an entirely different plan for the disposal of excreta, namely, that known as the "dry" method. This calls for the use of a galvanized-iron pail and a seat exactly like that of an ordinary water-closet (Fig. 9). At the side of the seat is a box for holding the absorbent, which consists of sifted coal-ashes or dry earth. After use a little of the absorbent is scattered in the pail, and when the pail is filled it is emptied on cultivated land—a field or a vegetable-bed. If the pail is emptied near the house, a little earth should be raked over the pile, and in a short time—a week or two in summer, with corresponding increase in cold weather

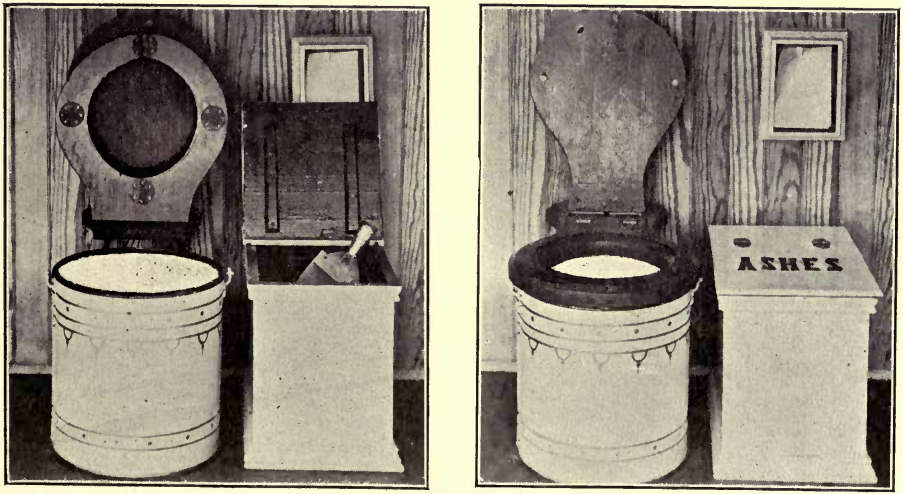

FIG. 9.—A MODERN DRY CLOSET.

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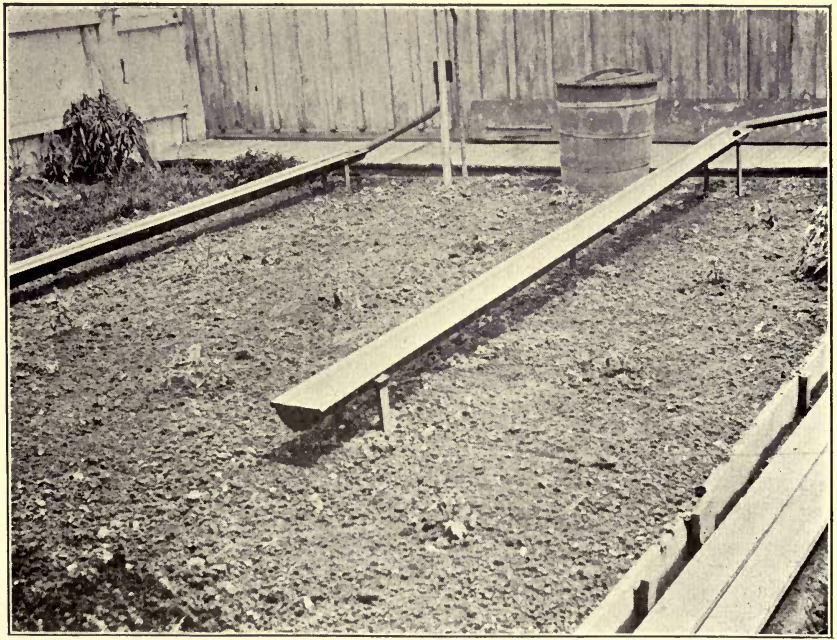

FIG. 10.—METHOD OF SUSPENDING SURFACE-DRAINS OVER GARDEN-BED.

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—all evidence of filth will have disappeared. Thus simple is the "dry" closet, an arrangement which, if taken proper care of, is perfectly cleanly, inodorous, and sanitary.

When the dry method is used we will have certain waste waters from the bath and kitchen sink to dispose of, and this is best done by some form of surface-drain suspended over the vegetable-bed. The one shown in the photograph (Fig. 10) is made of a six-inch galvanized roof-gutter pierced every twelve inches by one-fourth-inch holes. This allows the filthy water to be distributed evenly over the ground without forming puddles and mud-holes. The disposal of garbage, ashes, and rubbish is conducted in the same way as described previously.

A vegetable-bed may not seem a

very large piece of ground to receive the waste from an entire family, but the waste-destroying properties of tilled soil is very great indeed. The bed shown in Figs. 8 and 10, only sixteen by twenty feet in size, has received all the waste — dry-closet contents, kitchen offal, and slop-waters — from a family of four for the last ten years, and has destroyed all this filth without offense to sight or smell, and in addition has made the bed one of exceeding fertility.

CHAPTER V.

THE SURROUNDINGS.

PROPER attention to the grounds around a country house is desirable not only for the sake of attractiveness, but on account of the sanitary benefit derived. Uncut grass, dense foliage, decaying weeds and wood will spoil the appearance and lower the sanitary condition of almost any place. Trees, of course, are desirable for shade about a house, but should be trimmed high. It is a good plan to have a lawn immediately around the house, for a well-kept lawn is the most sanitary earth covering known, preventing excess of moisture

by evaporation and absorption, and promoting purity of the soil by the action of the growing grass.

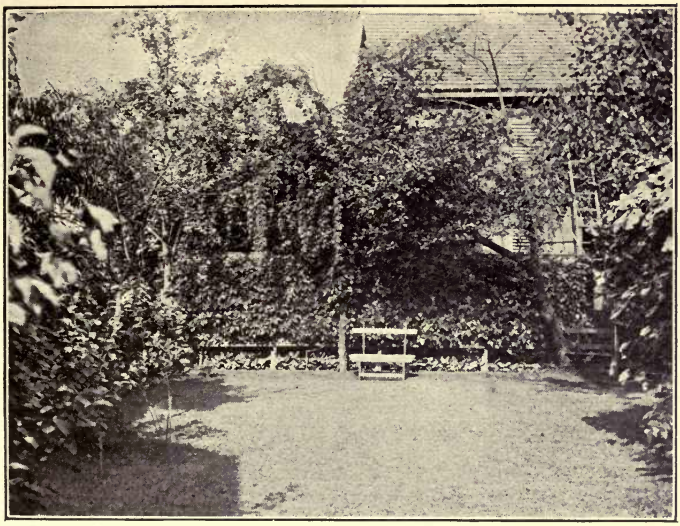
Though the majority of country dwellings have the front and exposed part of the grounds in very fair condition, there is very often a back yard or kitchen-garden which offers striking contrast to the rest of the premises and calls for more care and thought than is usually bestowed upon it. With the waste collected and disposed of as suggested in a former chapter, there is no reason why a back yard should not be in as good condition as any other part of the grounds. The vegetable-bed, though not unsightly if well cared for, can be surrounded, if one so desires, by a hedge of bushes or a trellis covered with vines. Such a bed should always be thoroughly cul-

tivated, kept free of all decaying vegetables and weeds, and when the proper time arrives should be cleaned and the rubbish destroyed by fire.

It is perhaps a good thing, in many places, to reserve a part of the stable-yard or kitchen-garden for rubbish which cannot immediately be disposed of, such as tree trimmings and the like; although the ideal method does not presuppose such a condition, but calls for immediate disposal. Unfortunately most of our terrestrial methods only approach the ideal, and we do the best we can under existing conditions. Even if it does become necessary to retain some of the waste on the premises for a time, this can be kept in such a condition as not to become a nuisance nor offensive; but to have such waste scattered everywhere, and perhaps

have in addition an open pail or two containing water and breeding thousands of mosquitoes, as I have shown in the photograph (Fig. 11), is surely inadmissible.

The outbuildings require a word, especially the stable, which, on account of being a great fly-breeding place, should be as far as possible from the house. That flies do sometimes transmit disease—notably typhoid fever—there is no longer a doubt, and their elimination, or rather diminution, is eminently desirable. Absence of the stable would be one of the most effective ways, but stables are necessary, and the best we can do is to diminish as much as possible their fly-producing properties. There are practically two ways of doing this. The first consists in using a closet



How the Back Yard Ought to Look.

Fig. 11.—How the Back Yard Frequently does Look.

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or pit which is thoroughly screened, as a receptacle for the manure. Another method is to cart the manure every day to the field for fertilizing.

This carting of stable manure immediately on to the field—a procedure which has been followed by a friend of mine for the last sixteen years—is, by the way, desirable not only from hygienic motives, but from an economic view; for the nitrogen of the manure, instead of being wasted in the stable-yard, gets into the soil just where it is needed. Probably a combination of the two methods would be more satisfactory, such as keeping the manure, for example, in a screened pit or closet, or a covered wagon, for several days and then removing to the field when convenient.

After prompt and careful manure

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disposal from the stable the next sanitary requisites are simply cleanliness, fresh air, and sunshine; in fact they are just as desirable in the stable as in the house. Hard-wood stalls, iron feed-racks, and concrete floors are all very well, but ordinary pine stalls which can be whitewashed several times a year, with a hard-clay floor, answer probably almost as well. Paramount considerations, however, are general cleanliness and fresh air. I know of a so-called model stable, which is indeed a model in every respect except that there is only a little over 400 cubic feet of air-space allowed each horse, while it is conceded by sanitarians that a healthy horse requires just about 1500 cubic feet of air-space—almost four times more than this model stable

grants. Even more necessary is it for cows to have sufficient air-space on account of their tendency to tuberculosis and the danger of consequent milk and meat infection. Yet I have before me the report of a recently completed dairy-barn, costing $8000, which allows only 780 cubic feet of air-space for each cow. Is it any wonder that there is so much bovine tuberculosis?

Drainage of the grounds about a country house is another eminently desirable thing. Marsh land especially should be drained or excavated into ponds, and streams should have firm banks devoid of weeds and high grass; all this on account of mosquitoes. Unless some such precautions are taken mosquitoes are likely to be a great pest in some country places. If they

were only a pest, we might be silent on the subject, but it is known without question that one family of mosquitoes — the Anopheles — transmits malaria, and this happens to be just the kind that live and breed in the country. Drainage, the introduction of small fish into ponds and pools, and treatment with kerosene are the methods used at present in mosquito warfare.

In Fig. 12 is shown the photograph of a small stream which flows through a country place, in the little rock-pools of which, at certain times, I have found countless numbers of the larvæ of Anopheles. In such a stream the fight against mosquitoes requires care and judgment. Every rain floods this brook, and of course with each flood the larvæ in these pools are drowned and carried away; however,

FIG. 12.—A WASTE-LAND BROOK, SHOWING MOSQUITO-BREEDING POOLS.

if no flood occurs for eight or ten days, considering that no fish live in the pools, it is likely that the existing larvæ would transform into full-fledged mosquitoes. So the only remedy during a drouth is to travel up and down this brook and spray kerosene on each pool—a labor which is by no means as great as it may seem.

In the South another family of mosquitoes transmits yellow fever, and the efficiency of the methods used in Cuba during American occupation is well known to every one. Inasmuch as mosquitoes of all kinds cling more or less closely to the place of their birth, individual action counts for much in isolated country houses.

CHAPTER VI.

THE SUMMER CAMP.

CAMP life is beginning to be so great a factor in American life that it deserves a little attention from sanitarians, inasmuch as one frequently hears of sickness being attributed to this source.

Just as I am writing this I notice a report of an increased amount of typhoid fever in all sections of New York State, and the health authorities investigating it have found that a large proportion of the sufferers are those who have passed their summer holiday in the country. With reports like this frequently appearing there can be no

question but that camp life, in many cases, has been and is a source of danger if one is careless in regard to the usual sanitary rules.

We are apt to think that everything in the woods is so fresh from the hand of the Maker that sanitary care is unnecessary; every spring and every brook seems to be pure and undefiled. If we could only drop into the "forest primeval," such would indeed be the case; but the fact is that wherever you go some one else has been there before.

I recall an incident in point which occurred to a friend of mine who was tramping through the wilds of Canada north of Lake Ontario. One day coming across a grave he remarked to the guide that he didn't suppose people died here. "Yes, they do, and of

typhoid fever and diphtheria," was the answer.

Let us investigate first the permanent camp which is occupied summer after summer. This, like any other habitation, evidently needs some care to keep clean. It will not be sufficient to throw waste materials just outside the door, for this is not only unsightly but tends gradually to cause pollution of the soil, air, and water, the very things one expects to avoid in going to the country. Tin cans, waste paper, and offal littering the virgin soil around a beautiful camp are even more jarring to one's sensibilities than when scattered about the village alley. There is, fortunately, no complicated system of waste disposal in the camp as in the city. All combustible rubbish should be burned and the non-com-

bustible—of which there will not likely be much — should be buried. All putrescible waste—that is, garbage—should be put into a regular garbage-hole and covered every evening, at least, with earth. This hole can be in some unfrequented place, or behind some cluster of bushes or trees, so as not to detract from the beauty of the place nor offend one's senses.

The only other waste to be considered, and by far the most important, is human excrement; for man's waste products become poisons when again taken into the system. The best way, and the only proper way, to dispose of this is by a dry closet somewhat after the form mentioned in a previous chapter: it need not, however, be elaborate in order to be effective. The one shown in the photograph (Fig. 13) is

made of rough slabs and in the crudest manner, yet it is perfect in its sanitary appointments, vastly better than many a city water-closet. I have frequently had friends inspect this, and they invariably remarked that the distinguishing odor was that of the cedar shingles used in constructing it. The earth used in the pail is taken directly from the field a few yards away, and the contents of the pail are emptied on the same field only a short distance from the camp, yet after this is covered with a little earth one can pass the spot without knowing it.

In regard to the water-supply of a camp it is only necessary to emphasize what was said in Chapter II. It is not safe to drink from every brook or spring one comes to. A good rule is always to see the other end first, or

FIG. 13.—THE SANITARY ARRANGEMENTS FOR A PERMANENT CAMP.

at least have knowledge of its entire drainage-basin, whether spring or brook. The case referred to on page 27 is typical of the existing condition of many of our small watercourses. Everything else being equal, springs and brooks having no human dwellings on their drainage areas are practically safe. When I say dwellings, I mean only temporary camps, especially "labor camps," for they are at times even worse than permanent dwellings as a focus of infection.

Sometimes the natural water-supply of the camp is so far away that it becomes necessary to have some supply nearer. In a certain camp where it was not desirable to go to the expense of using a ram, a good supply for washing and cooking was obtained by utilizing the rain-water collected from

the roof in a barrel (Fig. 14). While this rain-water is not as palatable as spring-water for drinking, it is splendid, on account of its softness, for cooking and washing, and is thoroughly sanitary. Of course the barrel must be screened so as to furnish no breeding-place for mosquitoes.

The temporary camp of a week or so, it is needless to state, does not require the same sanitary precautions as a permanent camp; yet a hole for garbage is a very desirable thing, and may save trouble for those who come after. A dry closet, such as described for a permanent camp, is not to be thought of, but a very good substitute is a sink such as is used by armies in the field: simply a short trench in the ground and a support, as shown in the photograph (Fig. 15). Such

FIG. 14.—AN INEXPENSIVE AND SANITARY METHOD FOR COLLECTING RAIN-WATER.

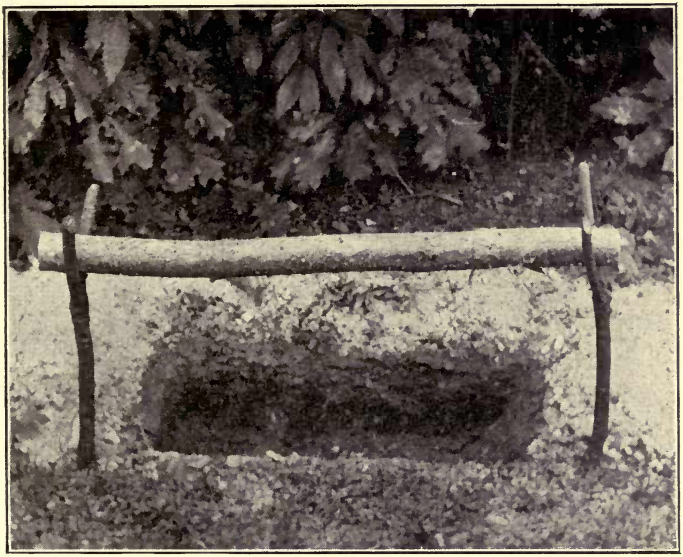

FIG. 15.—THE SANITARY ARRANGEMENTS FOR A TEMPORARY CAMP.

an arrangement, hidden by a clump of bushes, covered frequently with earth, and not placed near a water-course, is perfectly satisfactory from a sanitary point of view. If even this is too much trouble, there yet remains the "method of Moses," which has stood the test of some three thousand years, and can still be recommended: "And thou shalt have a paddle upon thy weapon; and it shall be, when thou wilt ease thyself abroad, thou shalt dig therewith, and shalt turn back and cover that which cometh from thee" (Deut. xxiii. 13).

For the water-supply of a temporary camp all the rules hold good that were laid down for other water-supplies. There is one additional point, however, that is worth mentioning. If the circumstance should arise when one

must use the water from some suspicious stream, it is well to practice the plan used by the natives of India, who dig little holes in the sand of the shore until they get below the water level. These holes soon fill with clear water, which, having filtered through the surrounding sand, is vastly safer than the raw water of the stream.

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